

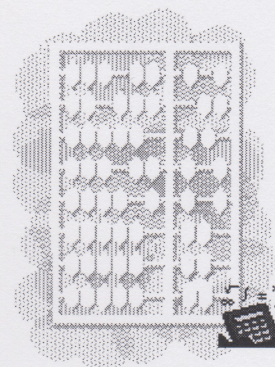
Calculating with Mathcad

Introduction

In this document you will learn more about entering and evaluating arithmetic expressions in Mathcad. You will also see how to alter the numerical format used to display the answers, i.e. the number of decimal places and the use of scientific or ordinary decimal notation.

Contents

- 2 Using brackets ... Task 1
- 3 Division, powers and the 'Up Arrow' key ... Task 2
- 4 Decimal places and scientific notation ... Task 3



Using brackets - Task 1

task 2 of 4

The tasks on the next two pages involve entering arithmetic expressions.
Once an expression is complete, typing the = key evaluates it and displays the answer.

- Follow the explicit key sequences provided.

There are brief comments below some of the examples to help with any typing technicalities.
(If you make a typing mistake, then you can use the [Backspace] key to rub out.)

Check your answers with the completed expressions shown at the right-hand side of the page.

Type this

Here

What you should see

► $2+3-4-5=$



$$2 + 3 - 4 - 5 = -4$$

Don't use the spacebar ! The spaces look after themselves.

► $2+3-(4-5)=$



$$2 + 3 - (4 - 5) = 6$$

Round brackets make a difference. They are given by [Shift]9 and [Shift]0.

► $2+3*4-5=$



$$2 + 3 \cdot 4 - 5 = 9$$

Remember that multiplication * is given by the asterisk, press [Shift]8.

► $(2+3)*(4-5)=$



$$(2 + 3) \cdot (4 - 5) = -5$$

► $9*2.3-4.5=$



$$9 \cdot 2.3 - 4.5 = 16.2$$

The decimal point . is given by a full stop.

Care is needed to distinguish between the decimal point and multiplication sign in expressions.

► $9*(2.3-4.5)=$



$$9 \cdot (2.3 - 4.5) = -19.8$$

Division, powers and the 'Up Arrow' key - Task 2

task 3 of 4

This page looks at calculations involving division and powers, and the role of the 'Up Arrow' key. Special keys like 'Up Arrow' are shown enclosed in thin square brackets, like this - [\uparrow].

You do not type these brackets !

Type this

Here

What you should see

► $1/4=$



$$\frac{1}{4} = 0.25$$

Division is given by the / key.

► $1/4+6=$



$$\frac{1}{4+6} = 0.1$$

After you have entered the division sign, typing continues in the denominator, below the line.

► $1/4[\uparrow][\uparrow]+6=$



$$\frac{1}{4} + 6 = 6.25$$

Type $1/4$, immediately followed by two presses of 'Up Arrow' [\uparrow], followed by typing $+6=$. Here the two 'Up Arrow' keystrokes group the expression $1/4$ (enclose it in a blue box), before typing continues as usual.

► $2^3=$



$$2^3 = 8$$

Powers are given by the ^ key, which is entered as [Shift]6.

► $2^3+4=$



$$2^{3+4} = 128$$

After you have entered the ^ key, typing continues in the power.

$$(2^{3+4} = 2^7 = 128)$$

► $625^3/4=$



$$625^{\frac{3}{4}} = 125$$

Once again, typing continues in the power.

$$(625^{3/4} = (625^{1/4})^3 = 5^3 = 125)$$

► $625^3/4[\uparrow][\uparrow][\uparrow]-99=$



$$625^{\frac{3}{4}} - 99 = 26$$

The three presses of the 'Up Arrow' key group everything typed so far.

Decimal places and scientific notation - Task 3

task

4

of 4

When displaying numerical answers, Mathcad has the following default settings :

- answers are rounded to three decimal places ;
- answers larger than 10^3 (or less than 10^{-3}) are displayed using scientific notation.

Examples

$$\frac{1}{3} = 0.333$$

$$2^{\frac{4}{3}} = 2.52$$

$$1000 + 1 = 1.001 \cdot 10^3$$

$$(2^3)^{-4} = 2.441 \cdot 10^{-4}$$

- Mathcad allows you to change these default settings.
Read the following instructions, then try the tasks below.

- (1) Select the **Math** menu and **Numerical Format...**
- (2) The 'Numerical Format' option box will appear.
Click on the 'GLOBAL' button if it is not already selected.
Set the desired values for 'Displayed Precision' (the number of decimal places)
and 'Exponential Threshold' (the threshold at which to change to scientific notation).
- (3) Click the 'OK' button to finish.

Task

- Change the default settings to : Displayed Precision 8, Exponential Threshold 8,
and note the effect that this numerical format has on the examples at the top of the page.

Mathcad should now display the four answers as 0.33333333, 2.5198421, 1001 and 0.00024414 .

(The answers are rounded to eight decimal places and all use ordinary decimal notation - as the switch to scientific notation is now made only if an answer is greater than 10^8 or less than 10^{-8} .)

Task

- Calculate the values of $78 / 98$ and 2^{100} .

Type **78/98=**



Type **2^100=**



Mathcad should display the two answers as 0.79591837 and $1.2676506 \cdot 10^{30}$.

The default settings for the numerical format take effect throughout the document (globally)
and are used when displaying the results of new calculations. So these two answers use
the default settings from the first task - Displayed Precision 8 and Exponential Threshold 8.

However, you can also set a particular (local) numerical format for an individual calculation.

For example $\frac{78}{98} = 0.7959183673$ (Displayed Precision 10)

- If you want to try this - click anywhere in one of the calculations on this page, then select the **Math** menu and **Numerical Format...** . The 'Numerical Format' option box appears.
Note that the 'LOCAL' button is already selected. Change the other settings as desired,
then click 'OK'. (Double-clicking on the answer will also bring up the option box.)

END